



Armed Forces College of Medicine AFCM



Histological structure of Salivary Glands

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Prof. of Histology & Cell Biology

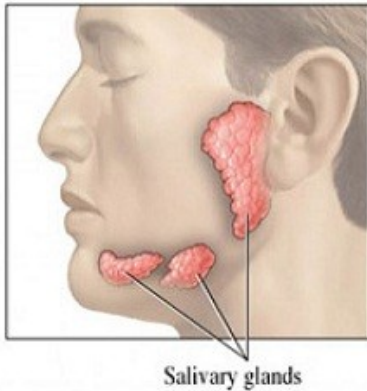
INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

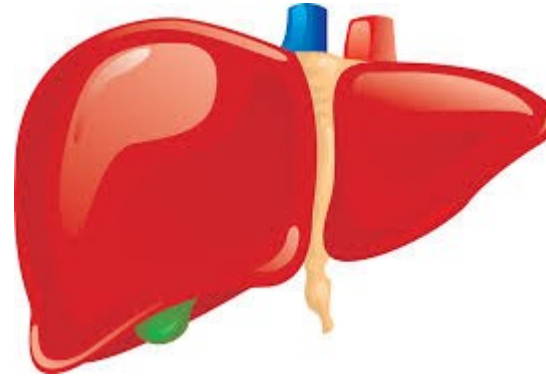
- Describe the structure of the major salivary glands.
- Correlate the structure of the major salivary glands to their functions.
- Interpret the altered microscopic structure of the salivary glands to the occurrence of different diseases.

Gut- associated glands



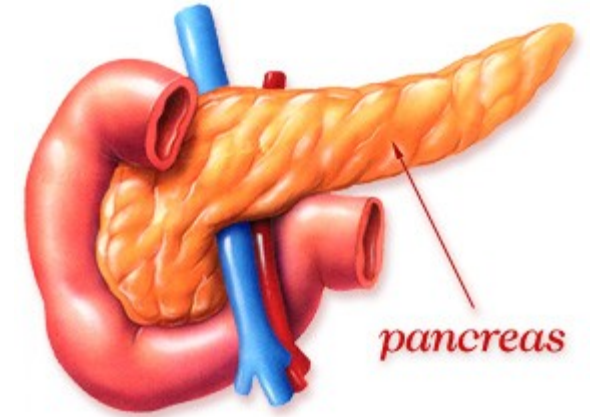
Salivary glands

<https://mgmtrialservices.medicalillustration.com/generateexhibit.php?ID=4626&ExhibitKeywordsRaw=&TL=&A=100264>



Liver

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Pancreas

https://66.media.tumblr.com/5e5e00b95e64ad03af663528d41b8709/tumblr_inline_p7fy7yQ4y21swujqt_540.jpg

Salivary glands



Main (major)
(3 paired glands)
Compound tubulo-



<http://edelweisspublications.com/keywords/30/1134/Salivary-Gland-Disorders>

Accessory (minor)
(Multiple & small)

They are groups of salivary glands having no capsules present in the lamina propria of the mucous membrane of the oral cavity.

A- Minor (accessory) salivary glands



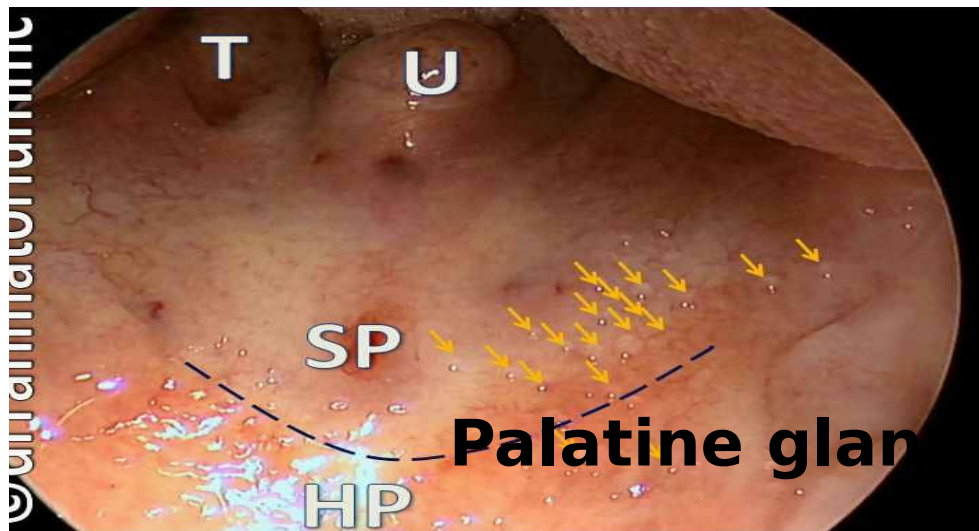
Lingual glands

<http://www.myhealth.gov.my/wp-content/uploads/median-rhomboid-glossitis.jpg>



Labial glands

https://tajpharma.com/Diseases_B/Cysticercosis.jpg



Palatine glands



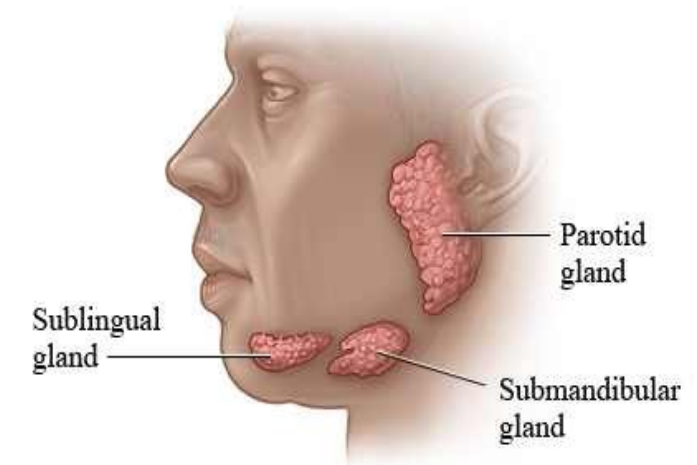
Buccal glands

B- Major (main) salivary glands

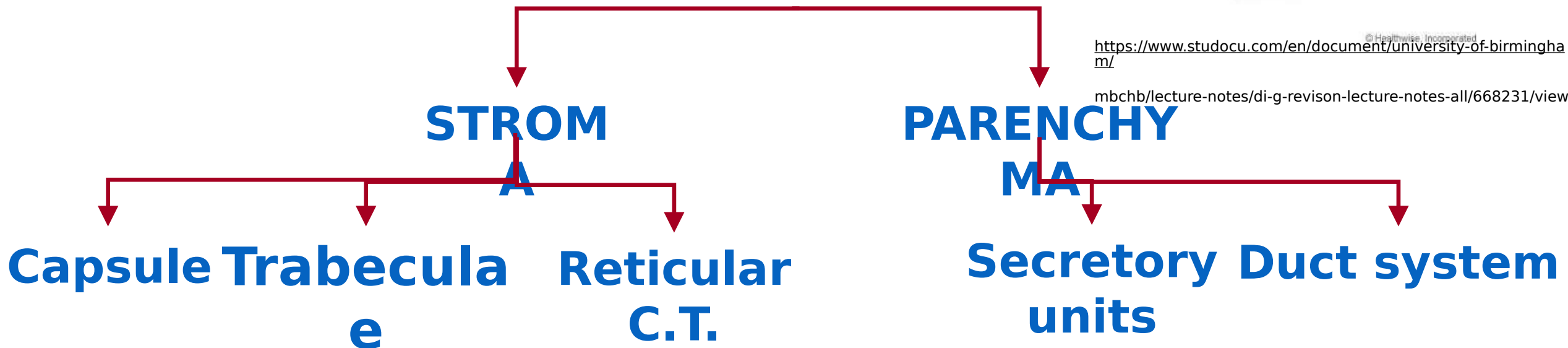


Three pairs of salivary glands:

- The parotid glands.
- The submandibular glands.
- The sublingual glands.



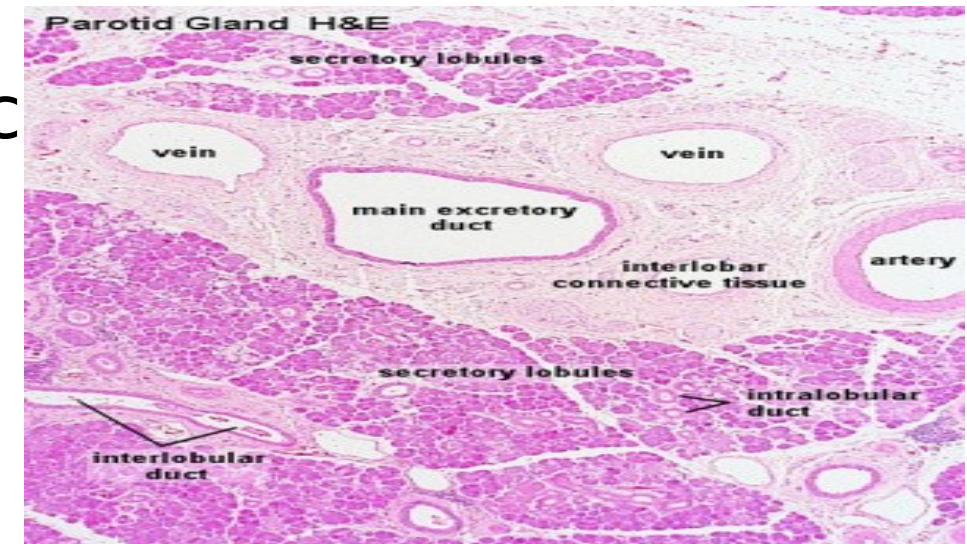
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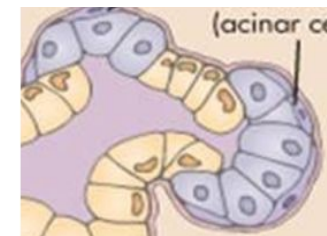
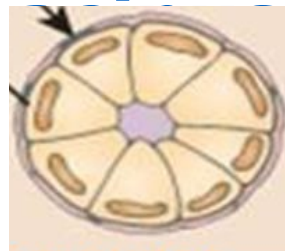
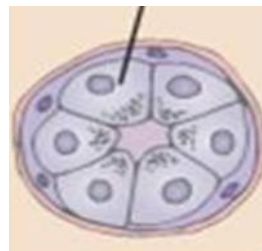
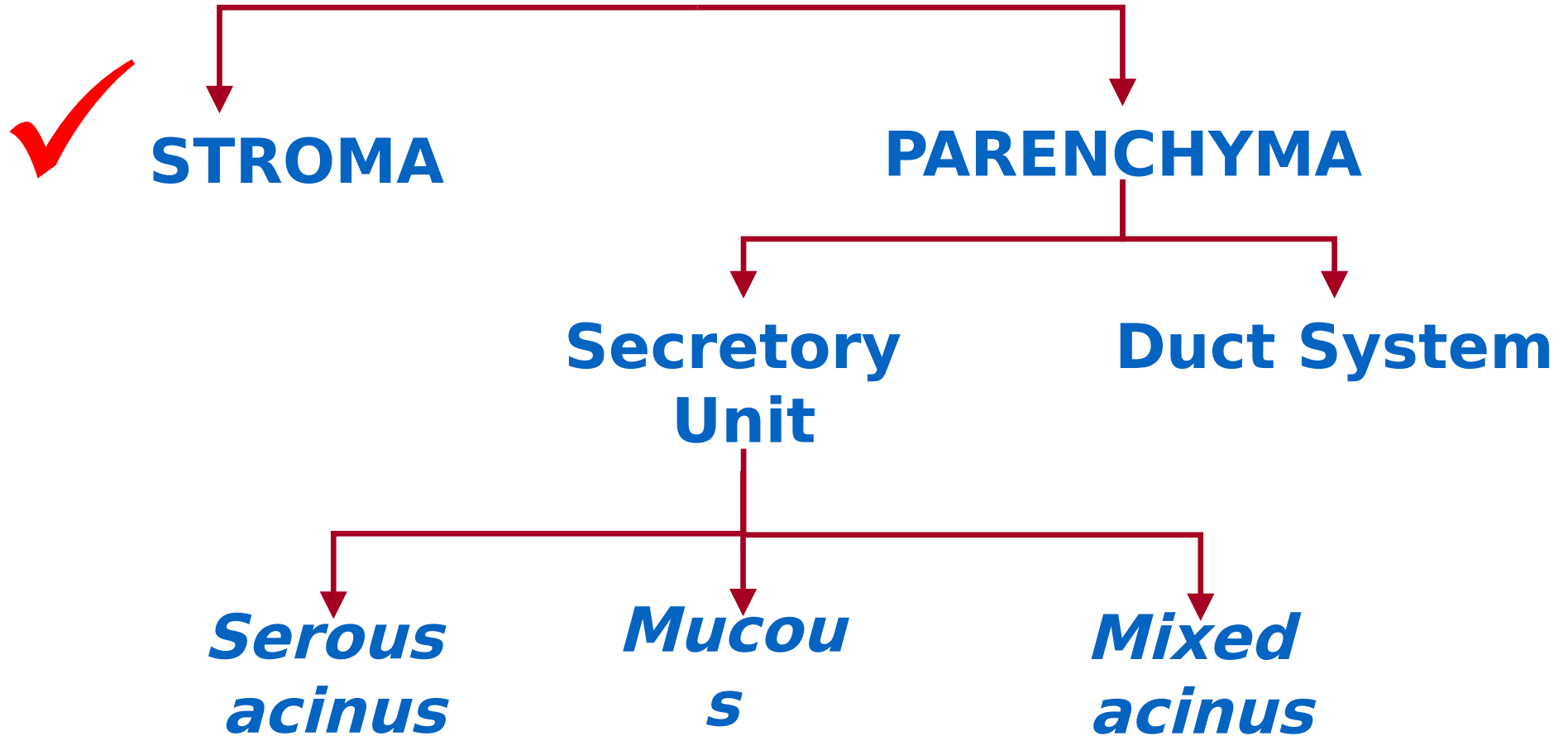
Stroma of main salivary glands



1. **A capsule:** of a **dense C.T.** containing (BVs, lymphatics and nerves).
2. **C.T. septa (interlobular septa):** divide the gland into □ lobules.
3. **Reticular C.T.:** supports the parench



Structure of main salivary glands

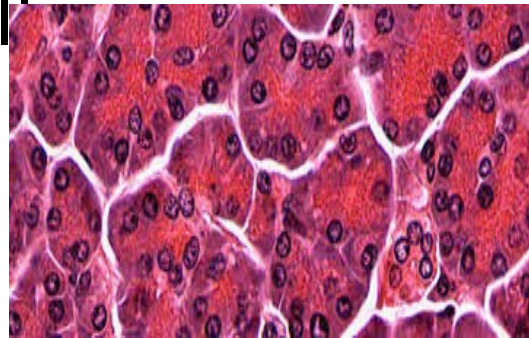


Serous acinus



LM

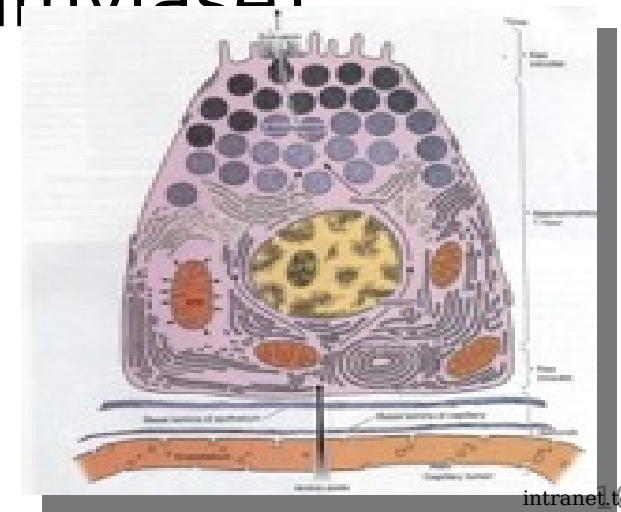
- Small in diameter & narrow lumen.
- Cells:
 - Vesicular, rounded basal nuclei.
 - Basal basophilic cytoplasm (BB)
 - Apical acidophilic zymogen granules (AA).
- Surrounded by a **few** myoepithelial cells



<http://www.siumed.edu/~dking2/erg/images/GI119b.jpg>

EM Protein secreting cell

- Abundant basal **RER**,
- Prominent supranuclear **Golgi** complex
- Numerous **Mitochondria**
- Numerous membrane bound spherical **granules**. (rich in amylase)

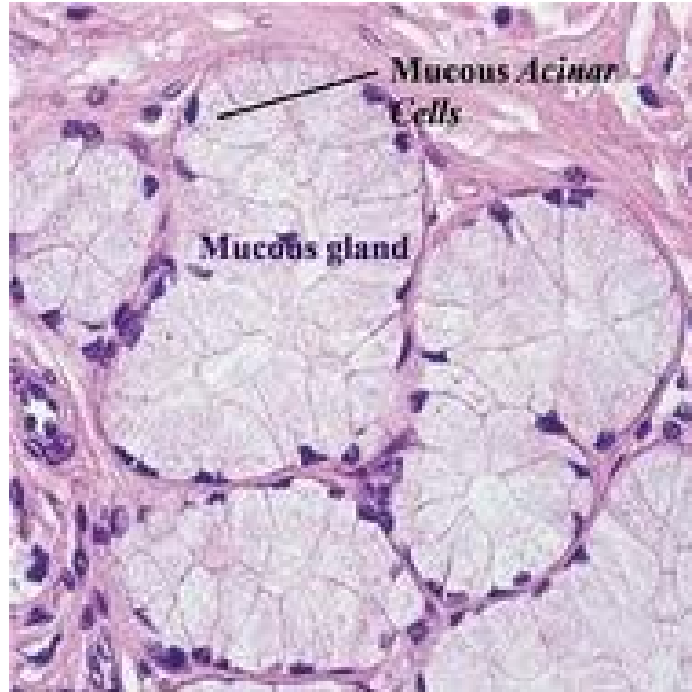


Mucous acini



LM

- Large diameter and wide lumen.
- Cells:
 - Flattened basal nuclei.
 - Pale basophilic, foamy cytoplasm (due to dissolved mucin granules).
- Surrounded by **numerous** myoepithelial cells .



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EM

Mucous secreting cell

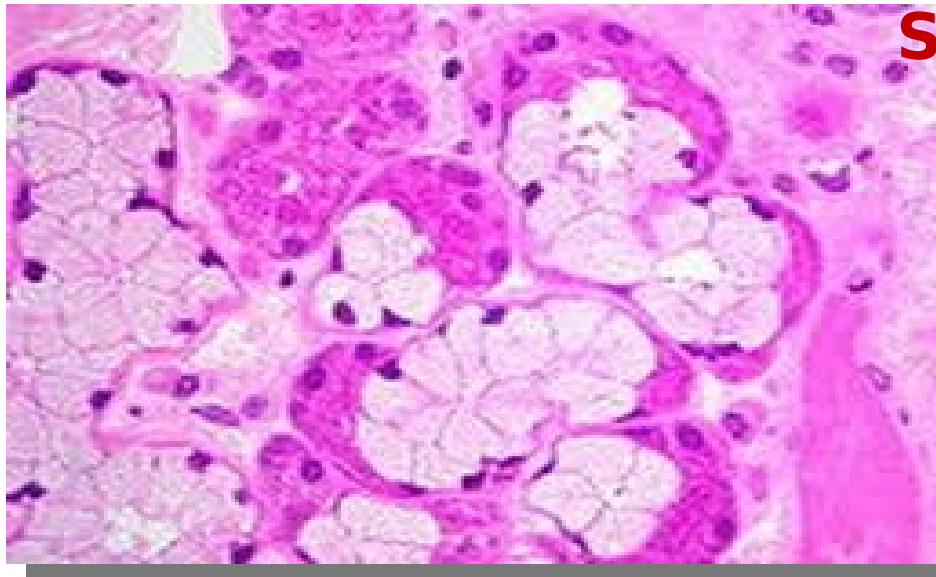
- Basal **RER**
- Supra nuclear **Golgi** (greater carbohydrate component)
- Numerous membrane bound mucin **granules**.
- **Mitochondria**

Mixed acinus



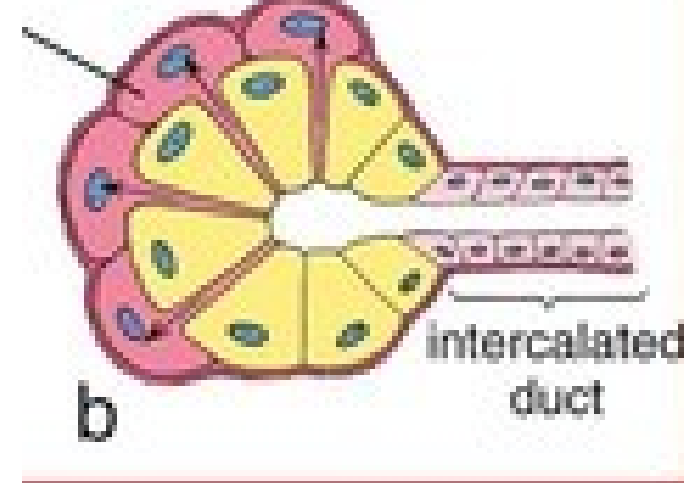
LM:

- Formed of a mucous acinus which is capped by aggregation of serous cells



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Serous demilune



<https://d1yboe6750e2cu.cloudfront.net/i/365620bc6821e24a6d69e446f417c518ed1f7bd0>

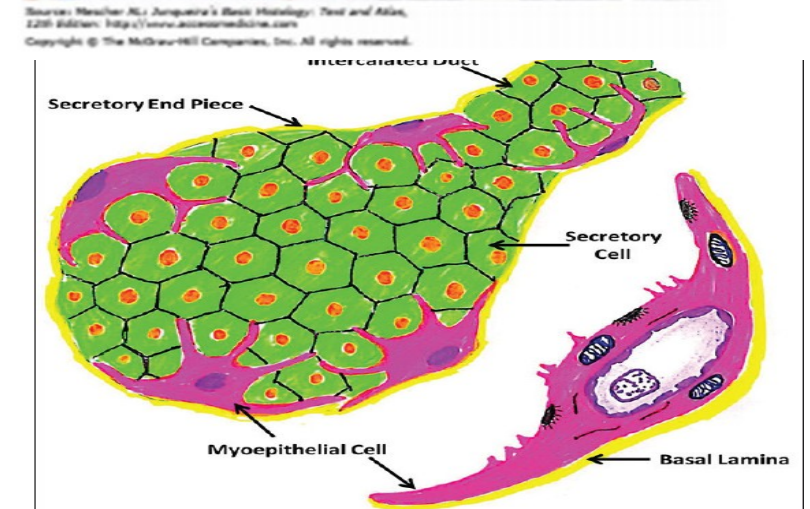
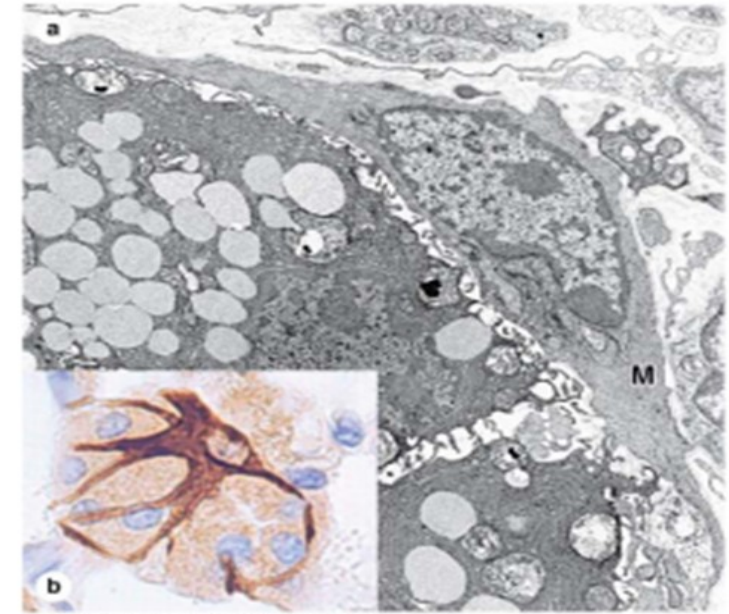
Myoepithelial (basket) cells



- Contractile cells having **actin** and **myosin**.
- Numerous processes.
- Present between plasma membrane of secretory cells and basal lamina & form **hemidesmosomes** with it.
- Also around cells of proximal part of duct system.

Function:

- Movement of secretion toward ducts



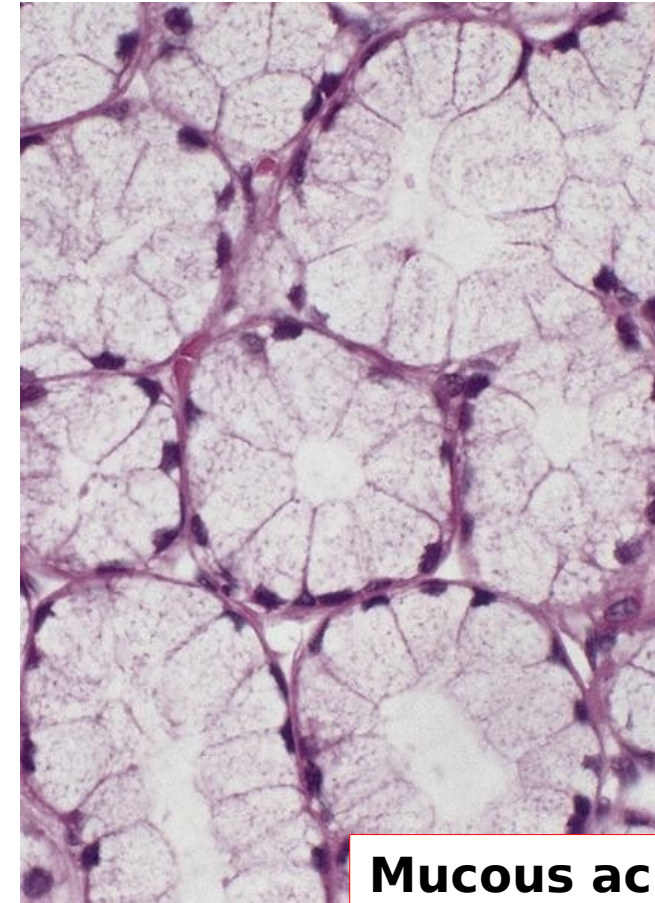
Lecture Quiz



Serous acini



Mixed acini



Mucous acini

Mescher AL: Junqueira's Basic Histology: Text and Atlas, 14th Edition.
<http://www.accessmedicine.com>

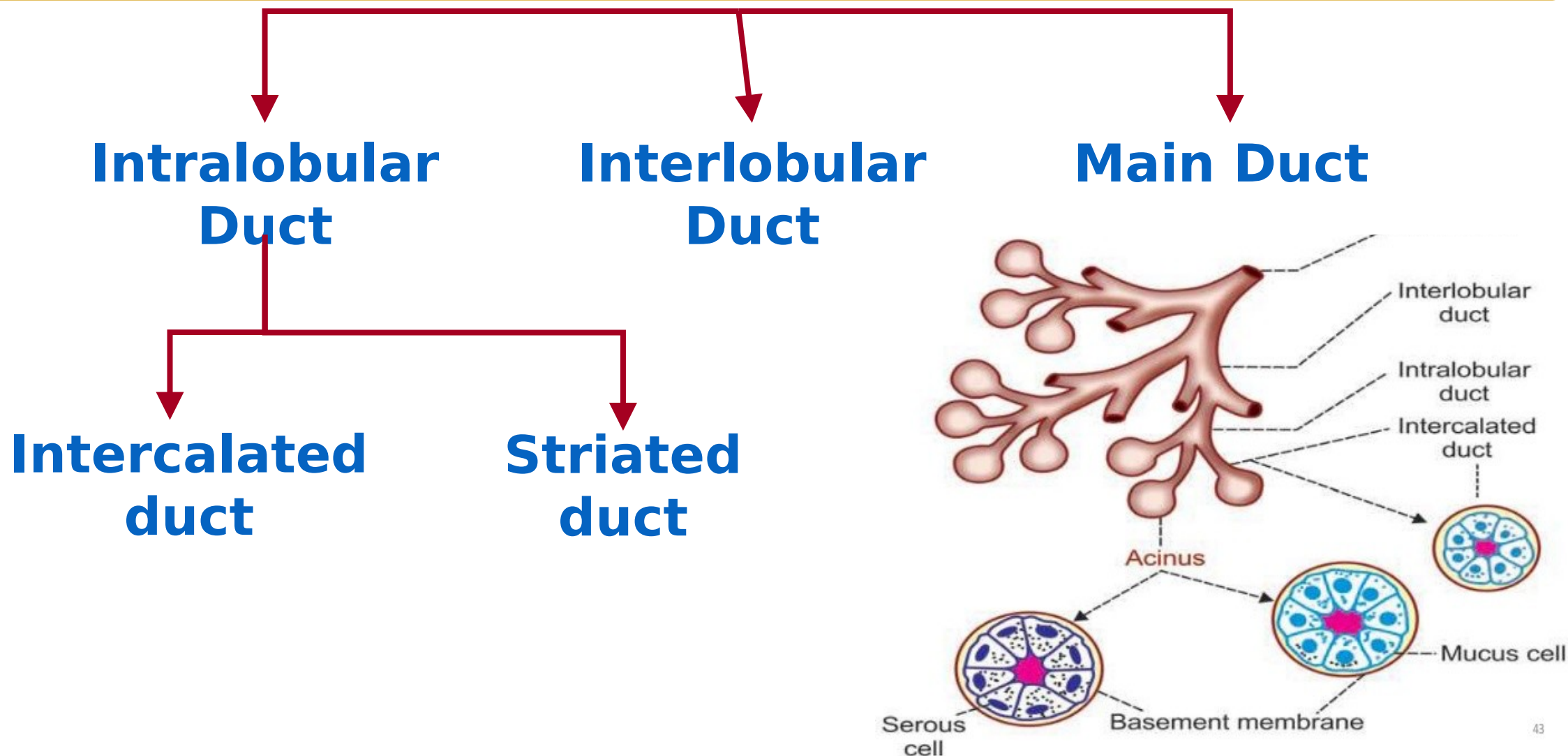
Types of acini



	Serous	Mucous	Mixed
LM Lumen Cell shape Nuclei Lateral border Basal cytoplasm Apical cytoplasm Myoepithelial cells			
E/M Organelles Lateral border Intercellular canaliculi			

This is an assignment!. Think about these items and fill in the

Duct system



<https://image.slidesharecdn.com/uppusalivaryg-150804093144-lva1-app6891/95/salivary-glands-43-638.jpg?cb=1496819611>

Duct system - Intralobular ducts



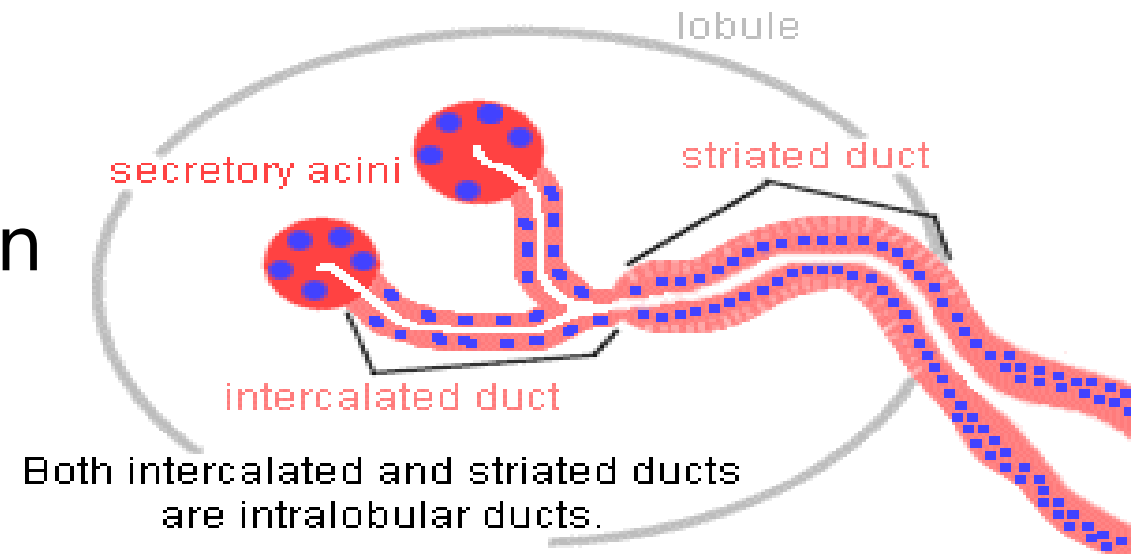
1- The intercalated ducts:

- Are lined by **cuboidal cells**.

- **Function:**

- 1- **stem cells....** have the ability to divide and differentiate into **secretory** or **ductal cells**.

- 2- Cl^- reabsorption, HCO_3^- excretion



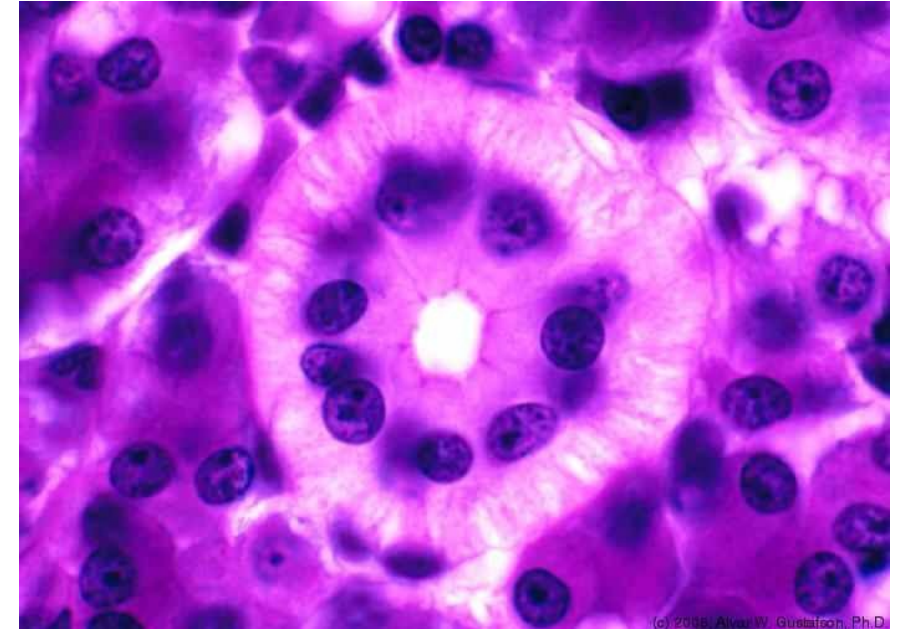


2- Striated (Secretory) ducts:

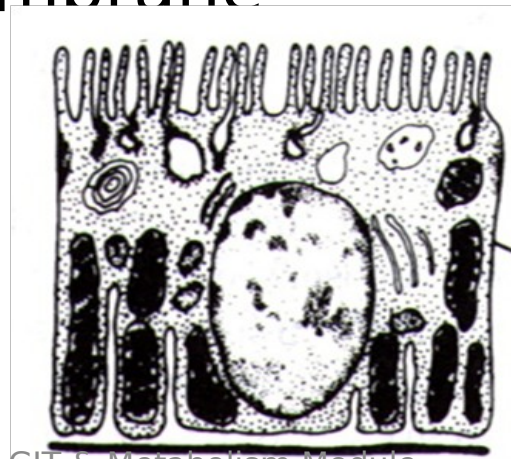
- Lined by cubical or low columnar cells
- Acidophilic granular cytoplasm, basal striation.

EM:

- Basal infoldings of cell membrane (contains Na-K ATPase).
- Basal mitochondria



https://lh3.googleusercontent.com/68losJLFr2uslqbc_pbHtQjdLt1jgkkg4Uq_udImgEScMArEm_SustveBtjKArgbNhp_bMM=s118





Functions of the striated ducts:

- 1. Modify the electrolytes** of the secretion of the acini (*Na reabsorption, HCO_3 & K secretion*, forming secondary saliva).
2. Secretion of **lysozymes** which attack bacteria.
- 3. Transport of IgA** secreted by the plasma cells present in the surrounding C.T. into its lumen.

The excretory ducts

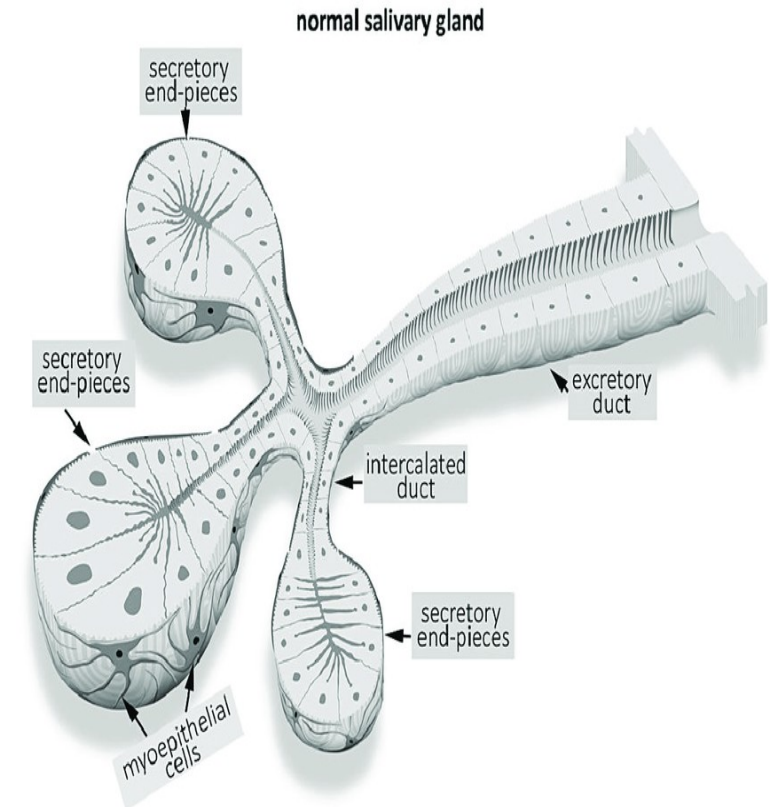


1- The inter lobular ducts:

- Small ducts □ columnar
- Larger ducts □ pseudostratified columnar
- Distal parts □ stratified columnar epithelium.

2- The main duct of each major salivary gland:

- The proximal part is lined with □ stratified columnar epithelium.
- The distal end is lined with □ non-keratinized stratified squamous epithelium which ultimately open □ into the mouth cavity.



https://www.researchgate.net/profile/Fernando_Soares3/publication/313837825/figure/fig11/AS:667035931533313@1536045167119/Schematic-view-of-the-normal-salivary-gland-structure-showing-the-secretory-end-pieces.png

Salivary Ducts



Na absorption
HCO₃ & K secretion

Cl absorption

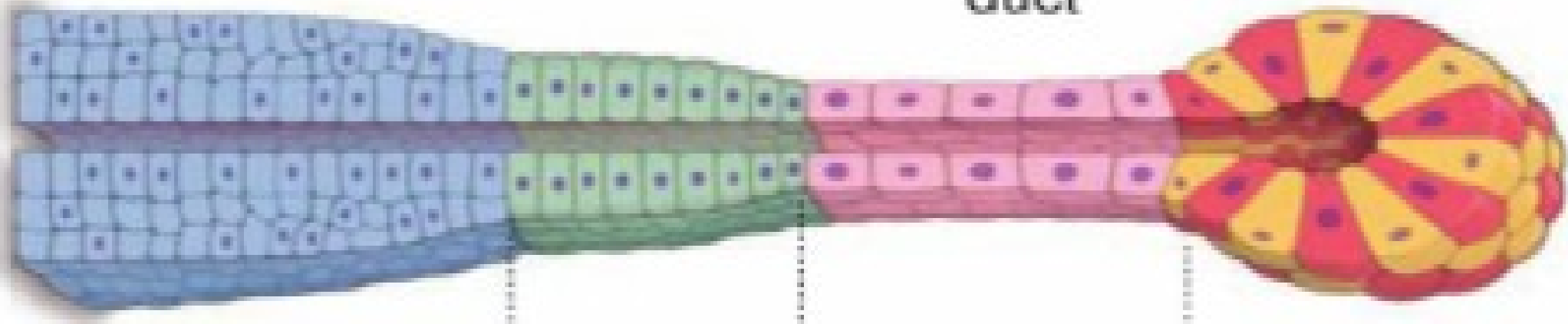
HCO₃ secretion

excretory duct

striated duct

intercalated duct

acinus

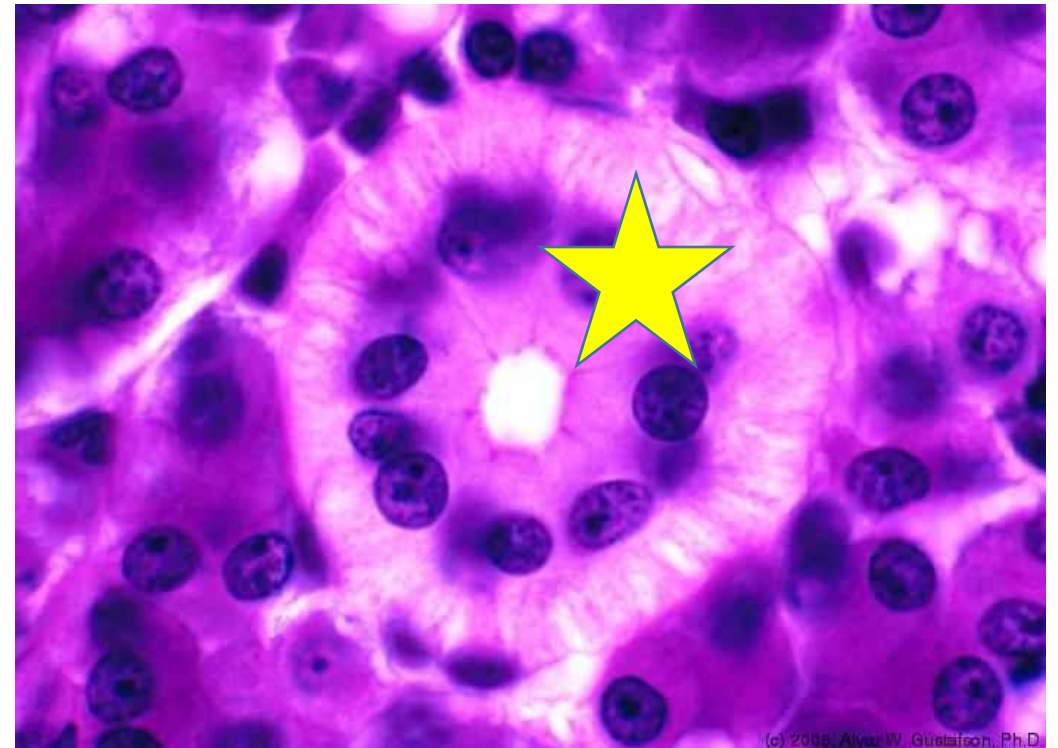


Lecture Quiz



Which of the following best describes the cells in this structure?

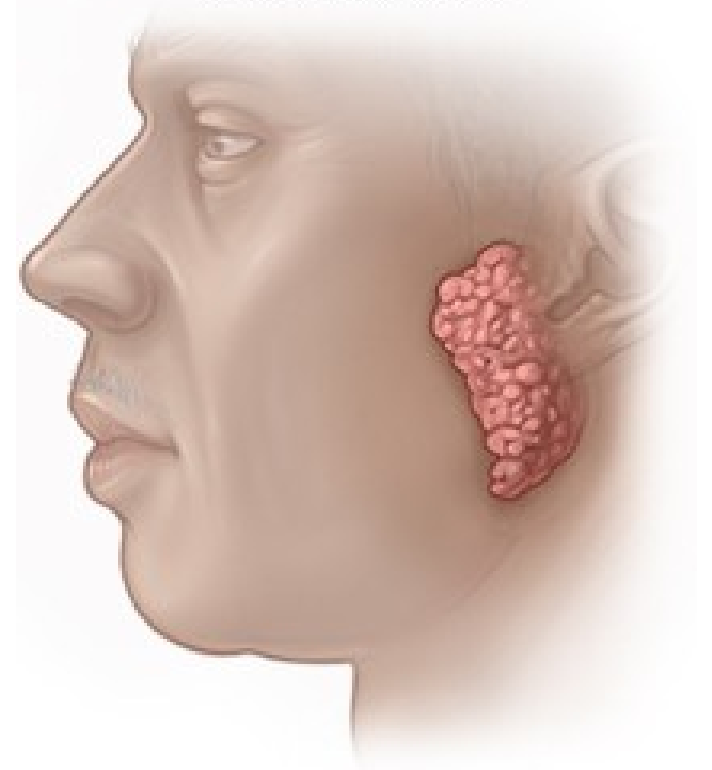
- a) Are squamous cells
- b) Have basal basophilic striations
- c) Contain Na-K ATPase
- d) Apical mitochondria
- e) Cells act as stem cells



The Parotid glands



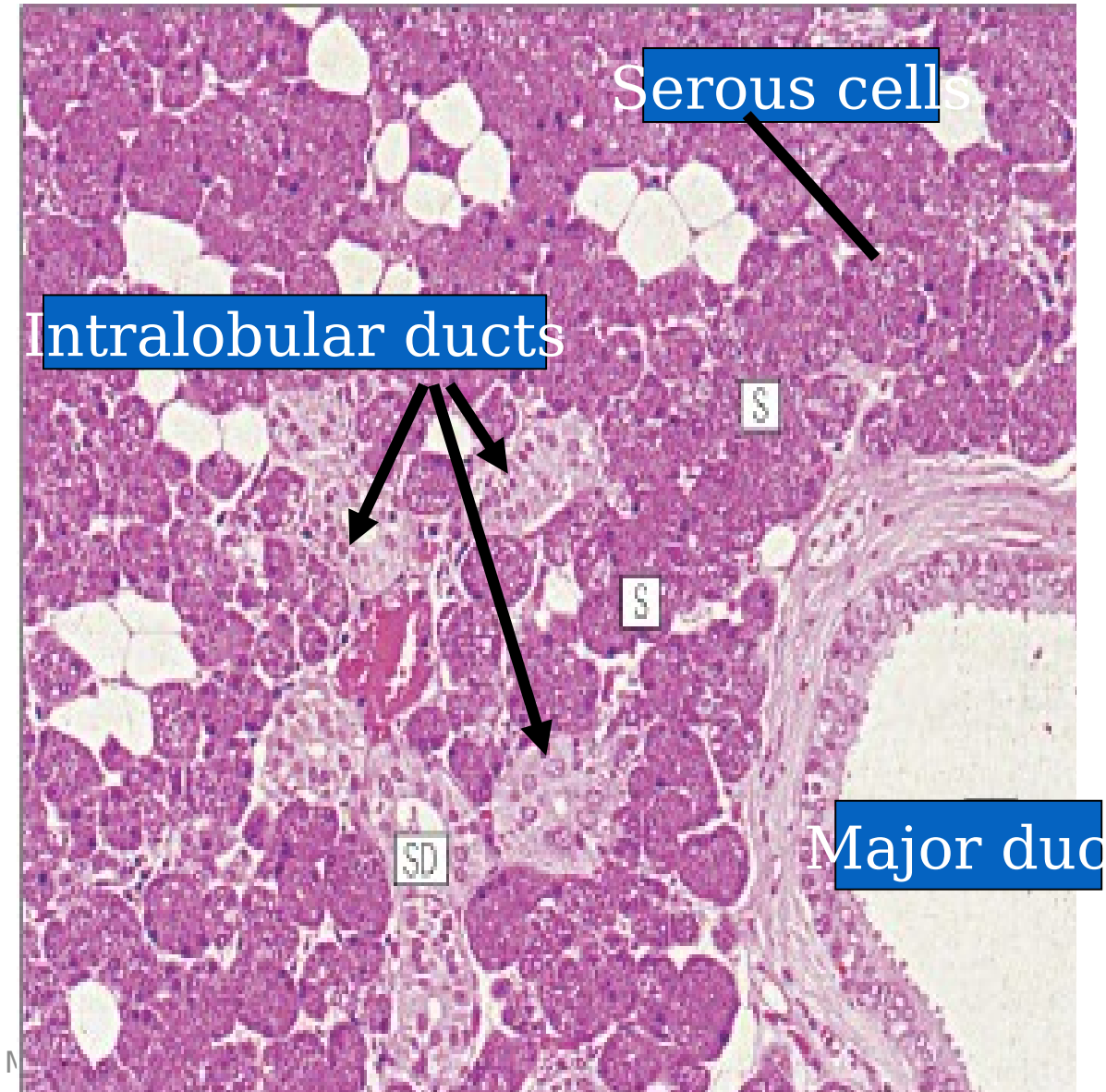
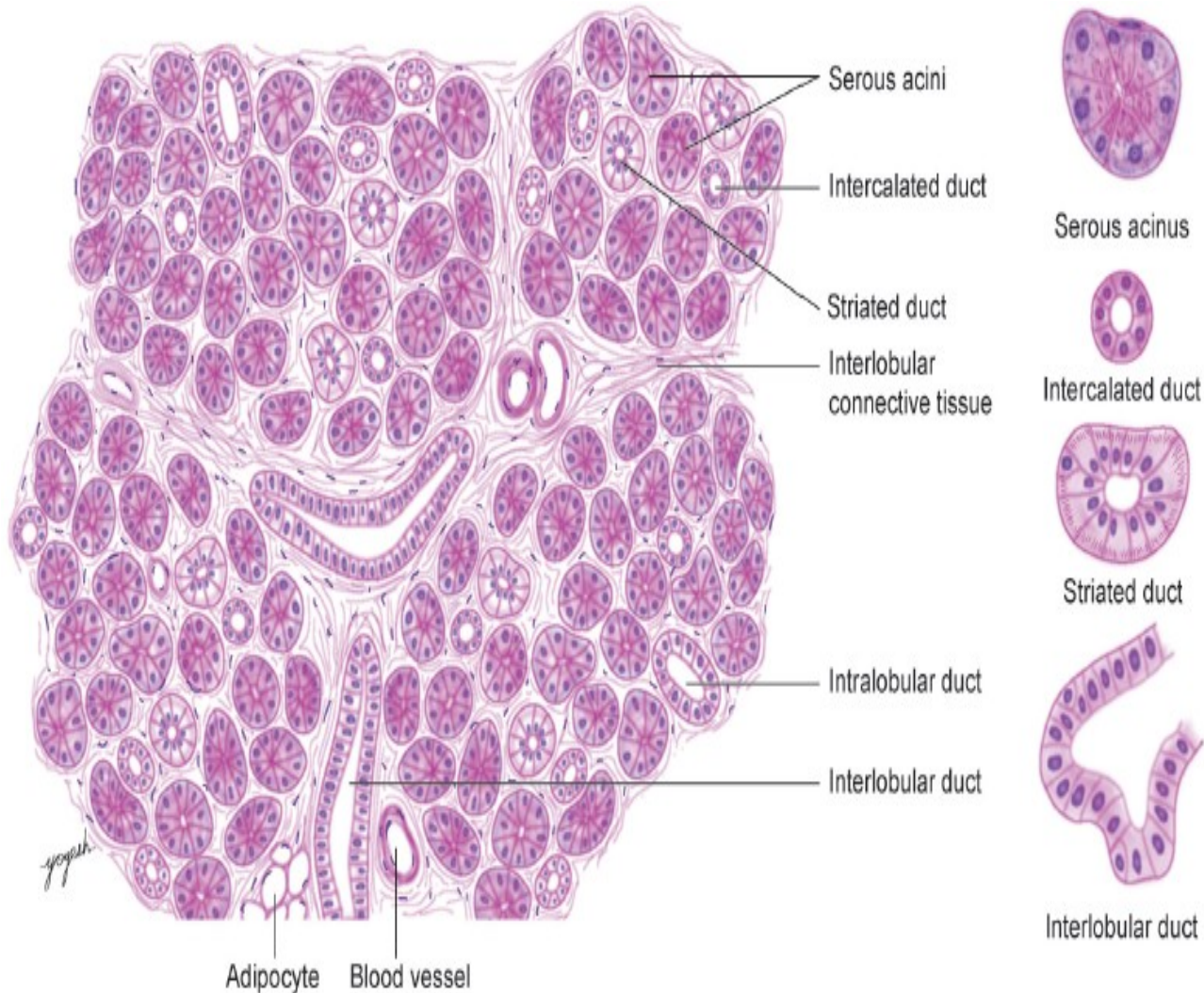
Parotid gland



Pure serous glands:

- Have a thick well-developed capsule and interlobular septa.
- The septa contains **fat**, lymphocytes and plasma cells.
- Have pure serous acini and prominent striated secretory ducts.
- The parotid excretory duct (**Stensen's duct**) opens in the oral cavity opposite the second upper molar tooth.

Parotid gland

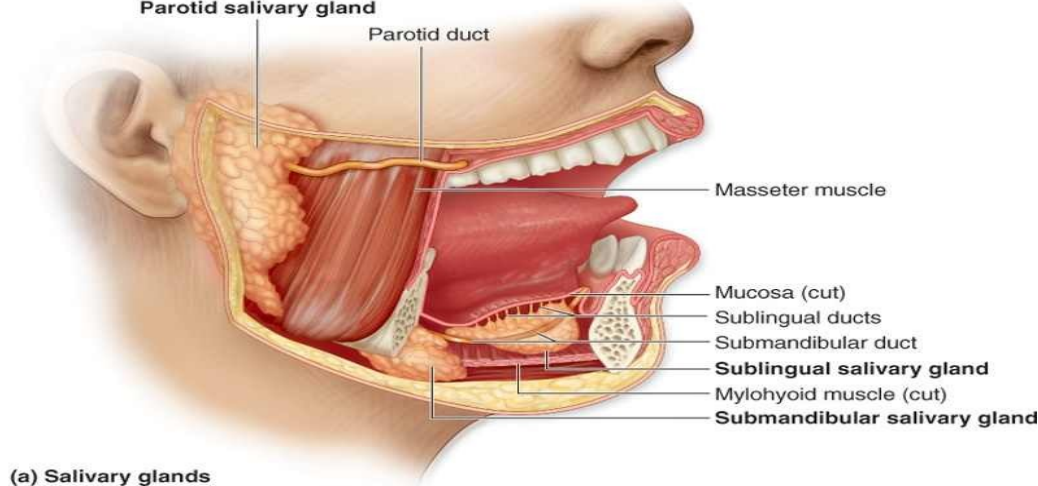


The submandibular glands

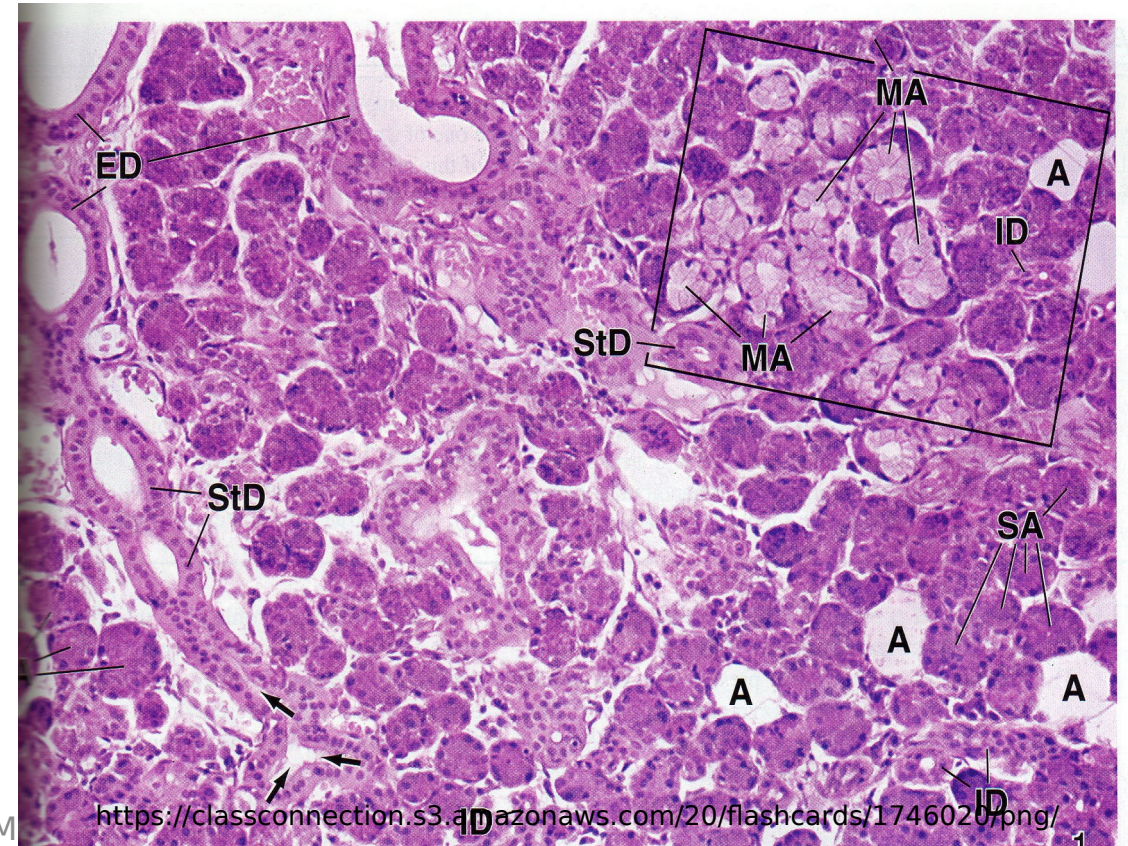


- Have a **thick C.T. capsule** and **thin C.T. septa**, containing **less fat cells**.
- The acini are **predominantly serous** with **few mucous and mixed acini**.
- **Fewer intercalated ducts**

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Parotid salivary gland



<https://i.pinimg.com/originals/f2/a4/5f/f2a45f807e7ea46c65339c20c04157e5.jpg>



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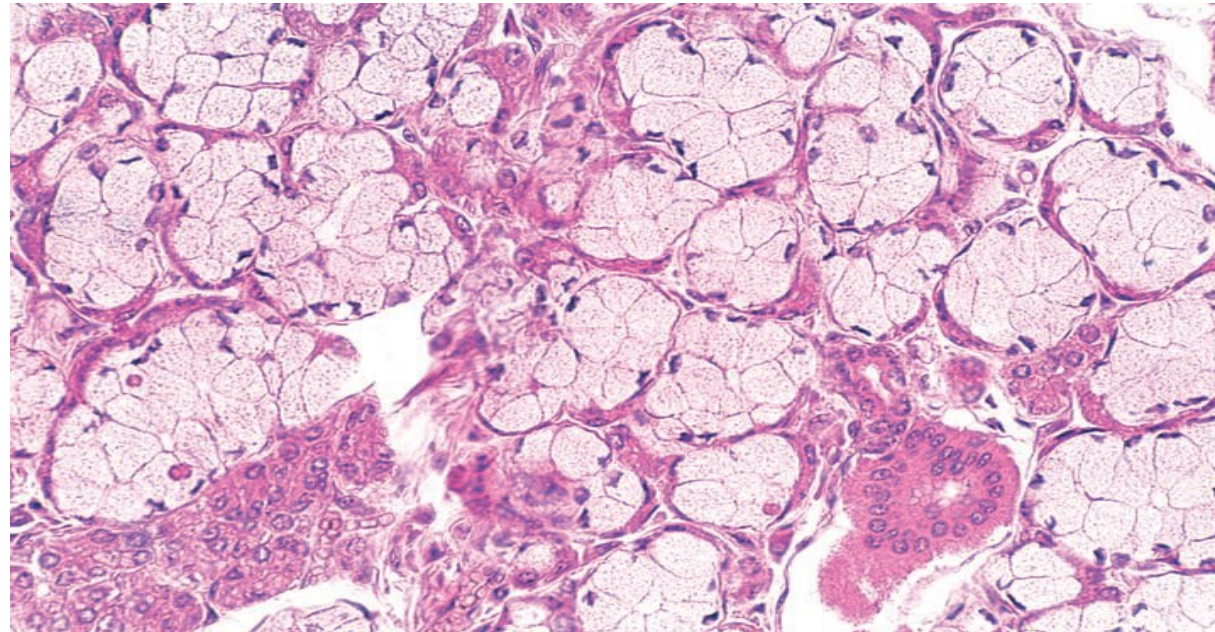
[how_do_you_identify_sd_vs_interlobular_1348335793157-thumb400.png](https://classconnection.s3.amazonaws.com/20/flashcards/1746020/png/)

The sublingual glands

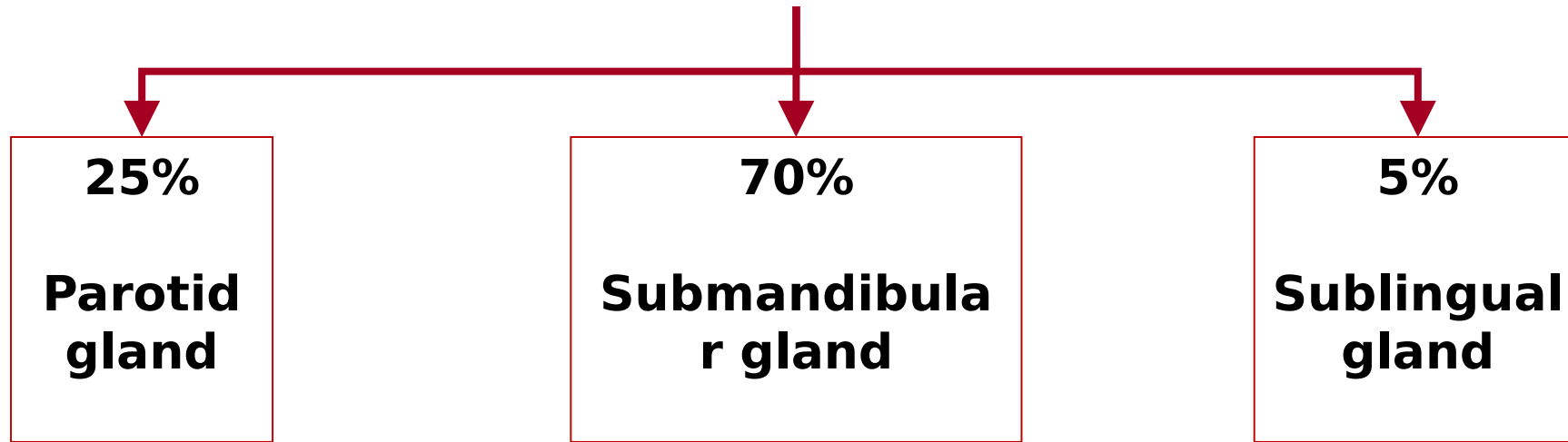
(mixed glands)



- Have **predominantly mucous acini** with **some mixed acini**.
- **No capsule, or very thin**
- **Difficult to see intercalated & striated ducts**



Saliva



Functions:

- Lubrication
- Taste sensation.
- Protective coat on teeth (proline rich protein).
- Initial digestion (amylase)
- Antibacterial (IgA & lysozyme)
- Wound healing (Epidermal Growth Factor & clotting F.)

Lecture Quiz



Which one of the following is a feature of mucous acini ?

- a. Wide lumen.
- b. Cells have ill-distinct boundaries.
- c. Cells contain central rounded nuclei.
- d. Acidophilic zymogen granules.
- e. Basal infoldings

Which of the following is a feature of serous acini ?

- a. Have centro-acinar cells in their lumen.
- b. Surrounded by numerous basket cells.
- c. Lined by pyramidal cells with indistinct boundaries.
- d. Show basal flattened nuclei.
- e. Have vacuolated cytoplasm

Which of the following describes the acini of the submandibular glands?

- a. purely serous
- b. purely mucous
- c. Predominantly mucous
- d. Predominantly serous
- e. Half serous/half mucous

Which of the following about myoepithelial cells is true?

- a. Non-branching cells with many processes.
- b. Located in the capsule of salivary glands.
- c. Cover the initial part of intercalated duct.
- d. Spindle shaped around the acini of salivary glands
- e. Numerous in parotid gland

Lecture quiz



A 48-year-old woman is referred to an allergy and rheumatology specialist with itching eyes, dryness of the mouth, difficulty swallowing, loss of the sense of taste, hoarseness, fatigue, and swollen parotid glands. She reports increasing joint pain over the past 2 years. She complains of frequent mouth sores. Laboratory tests show a positive antinuclear antibody (ANA) and rheumatoid factor (RF) levels of 70 U/mL (normal < 60 U/mL) by the nephelometric method. A parotid gland biopsy shows inflammatory infiltrates in the interlobular connective tissue with damage to the acinar cells and striated ducts. In this case, resorption of which of the following will be most altered by destruction of those ducts?

- a) Na⁺
- b) H₂O
- c) HCO₃⁻
- d) Cl⁻
- e) Ca²⁺

Lecture quiz



B	A
Contain actin and myosin	Serous cells
Have basal infoldings	Intercalated duct
Secrete glycoprotein	Myoepithelial cells
Have acidophilic secretory granules	Mucous cells
Cuboidal cells	Striated duct

Summary



Architecture of salivary glands

Stroma

Connective tissue

Capsule

Septa divide gland into lobes and lobules
(sublingual gland: capsule absent)

Parenchyma

Acini

Ducts

Mucous acini

Lined by pyramidal cells:
- Basal flat nucleus
- Foamy cytoplasm
Wider lumen

Serous acini

Pyramidal cells:
- Basal basophilia
- Apical eosinophilia
- Round basal nucleus
Smaller lumen

Mixed acini

Mucous acini with serous demilunes

Intralobular

Intercalated:
- Simple cuboidal epithelium

Striated:
- Simple columnar epithelium with basal infoldings

Interlobular/lobar/main ducts

Gradual changing epithelium from columnar – stratified columnar – stratified cuboidal – stratified squamous

Summary



- **Salivary glands** have secretory units of either **protein-secreting (serous cells)**, usually organized in round or oval **acini**, or of **mucin-secreting (mucous cells)** in elongated **tubules**.
- **Parotid glands** have only serous acini; **sublingual glands** are mixed but have primarily mucous tubules, some with **serous demilunes**; **submandibular glands** are also mixed but have mainly serous acini.
- Salivary secretory units are drained by simple cuboidal **intercalated ducts**, which merge as simple columnar **striated ducts**, which merge further as the larger interlobular or **excretory ducts**.
- Cells of **striated ducts** have mitochondria-lined, basolateral membrane folds specialized for electrolyte reabsorption from the secretion; **excretory ducts** are unusual in having **stratified cuboidal or columnar cells**.

SUGGESTED TEXTBOOKS

